Taxonomic observations on *Stylidium spathulatum* (Stylidiaceae), with the description of three allied species from section *Saxifragoidea*

Juliet Wege

Western Australian Herbarium, Department of Environment and Conservation,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983

Abstract

Wege, J.A. Taxonomic observations on *Stylidium spathulatum* (Stylidiaceae), with the description of three allied species from section *Saxifragoidea*. *Nuytsia* 16(1): 233–246 (2006). *Stylidium spathulatum* R.Br. (n=14) is lectotypified and a revised species description provided. On the basis of cytological and morphological evidence *Stylidium planirosulum* Wege (n=13) and *S. glandulosissimum* Wege (n=13) are described as new. A third morphologically allied species with conservation priority, *Stylidium gloeophyllum* Wege, is also described. Variation in trichome structure and distribution is shown to be highly diagnostic. Illustrations are provided for the three new species.

Introduction

James (1979) demonstrated that the speciation of *Stylidium* within the south-west of Western Australia is associated with extensive chromosome number change, a phenomenon also hypothesized to occur in trigger plants from northern Australia (Wege 2004). Numbers range from n = 5 to n = 16, with polyploidy on 13, 14 and 15 reported for some species. Studies on morphologically allied species complexes have further established that a change in chromosome number is often a feature of species differentiation (Banyard & James 1979; Farrell & James 1979; Coates 1982; Lowrie *et al.* 1998; Lowrie *et al.* 1999; Wege 2006).

In his landmark study, James (1979) recorded a chromosome number of n = 14 for *S. spathulatum* R.Br. and n = 13 for *S. spathulatum* subsp. *glandulosum* (Mildbr.) Carlquist. Although he suggested the latter taxon required elevation to specific status, this nomenclatural change has never been formally published. As part of the same study, James also detected an anomalous population of *S. spathulatum* from the Shannon region with a count of n=13. Annotations on the voucher specimen indicate that he also believed this entity to be a discrete species. Morphological and anatomical data are provided herein to support the recognition of both entities at the species level. A third related entity with conservation priority is also described and a revised description of *S. spathulatum* provided.

The species described herein belong to *Stylidium* subgenus *Tolypangium* (Endl.) Mildbr. section *Saxifragoidea* Mildbr. All are characterised by a basally-rosetted habit, glandular-hairy leaves and racemose inflorescences bearing flowers with yellow, laterally-paired corolla lobes.

Methods

This research is based on herbarium specimens housed at CANB, K, LD, MEL, NSW, P, PERTH, RSA and W, and on the field observations of the author. Morphological characters were coded using a combination of fresh, spirit and herbarium material. Corolla lobe measurements were based on the following wet samples, stored in 70% ethanol: *S. spathulatum* (*Wege* JAW 422, 437, 842, 1056, 1058, 1062, 1116, 1161, 1167); S. *planirosulum* (*Wege* JAW 807, 824, 1171, 1186); *S. gloeophyllum* (*Wege* JAW 82, 1049, 1151, 1178); *S. glandulosissimum* (*Wege* JAW 78, 291, 1045, 1069). Trichomes were sampled from a subset of wet collections, cleared in domestic bleach and mounted in Apathy's aqueous mountant before examination under a compound microscope. Data were recorded as a DELTA dataset (Dallwitz *et al.* 1993), from which species descriptions were generated.

Trichomes

Trichomes are a characteristic feature of the majority of species of *Stylidium* and their structure and distribution can be highly diagnostic. The species discussed herein possess glandular trichomes with multicellular, biseriate stalks; however, the length of the stalk and the structure of the glandular head is variable (Figure 1). *Stylidium planirosulum* is characterised by long trichomes on the leaves and lower scape (0.4–1 mm; Figure 1A) and shorter trichomes on the pedicels (0.2–0.4 mm). The glandular heads are comprised of cells in 4 columns and 2 or 3 rows. In contrast, the trichomes are much shorter in *S. gloeophyllum* (0.08–0.3 mm long), and possess flattened, disciform heads comprising several cells arranged in a horizontal plane (Figure 1B). A similar trichome structure is evident in *S. glandulosissimum* (Figure 1C). The trichomes found in *S. spathulatum* are different from the aforementioned species, varying in length from 0.2–0.5 mm long and terminating in a 4-celled glandular head (Figure 1D). All four species possess glandular-hairy leaves; however, the distribution of the hairs on the inflorescence is variable and is outlined in the descriptions below.

Taxonomy

Stylidium spathulatum R.Br., Prodr. 569 (1810). Base name for *Candollea spathulata* (R.Br.) F.Muell. Syst. Census Austral. Pl. 85 (1882). *Type*: Princess Royal Harbour, King Georges Sound, Dec. 1801, *R. Brown*, Bennett No. 2585 (*lecto*, here designated: BM!; *isolecto*: BM! K 000060697!).

Stylidium bellidifolium Sond. *in* C. Lehmann, Pl. Preiss. 1: 376 (1845). *Type*: In arenosis ad litus Point Possession, 16 Oct. 1840, *Preiss* 2259 (*lecto*, here designated: MEL!; *isolecto*: LD!, MEL!, P!, W!).

Stylidium lehmannianum Sond., Delectus Seminum quae in Horto Hamburgensis Botanico: 7–8 (1844). Base name for *Stylidium spathulatum* var. *lehmannianum* (Sond.) Mildbr. *in* A. Engler, Pflanzenreich IV, 278: 58 (1908). *Type*: not cited [given by Sonder *in* C. Lehmann, Pl. Preiss. 1: 375 (1845) as "In solo limoso inter frutices ad latus meridionali-occidentale montis Clarence, Plantagenet", 7 Dec. 1840, *Preiss* 2261]. (*lecto*, here designated: MEL 2069495!; *isolecto*: LD!, MEL 2069496!, MEL 2069497!, MEL 2069498!, P!, W (4 sheets)!).

Stylidium lehmannianum var. *gracile* Sond. [published as ß gracile] *in* C. Lehmann, Pl. Preiss. 1: 376 (1845). *Type*: in limoso-glareosis sterilibus districtus Hay, 8 Nov. 1840, *Preiss* 2260 (*lecto*, here designated: MEL 2069494B!). In rupestribus ad Princess Royal Harbour, 11 Oct. 1840, *Preiss s.n.* (*paralecto*: MEL 2069494A!).

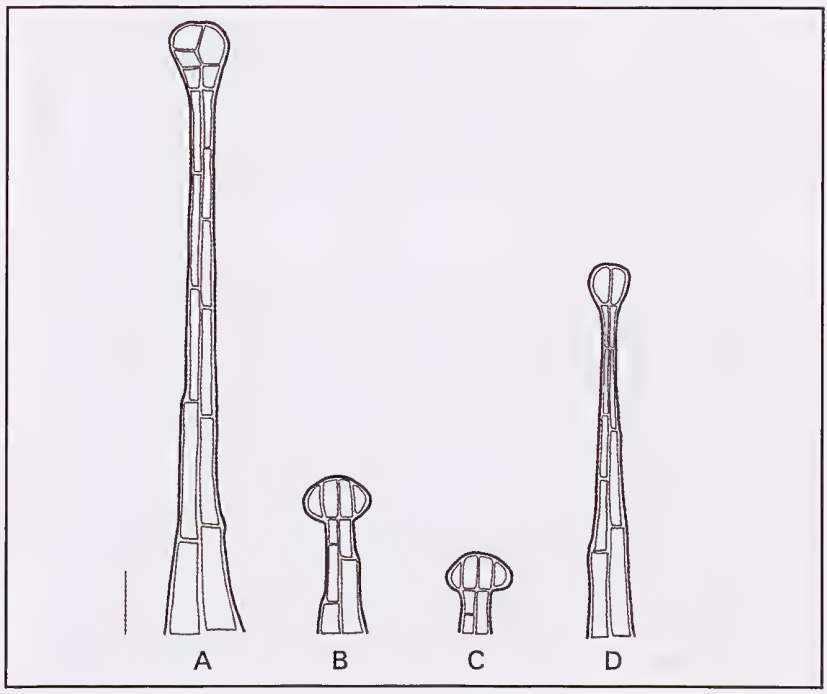

Figure 1. Leaf trichome structure in A – *Stylidium planirosulum* (JAW 807); B – *S. gloeophyllum* (JAW 1049); C – *S. glandulosissimum* (JAW 1069); D – *S. spathulatum* (JAW 842). Scale bar at 50 ì m.

Stylidium spathulatum R.Br. f. *luxuriens* Wawra, Itinera principum S. Coburgi 1: 130 (1883). *Type*: Australien, King George's Sound, *Wawra* Coll. I 909 (*holo*: W!).

Stylidium spathulatum R.Br. var. *obovatum* Ostenf., Biol. Meddel. Kongel. Dankse Vidensk. Selsk. III, 2: 126 (1921). *Type*: Wilgarup, south of Bridgetown, 1 Oct. 1914, *C.H. Ostenfeld* 1071 (*holo*: K000060707!).

Illustrations. Botanical Magazine (1872) Tab 5953, 98; Ostenfeld (1921) plate XII, figure 3; Erickson (1958) Plate 32, Nos. 10–17, p. 113; Carlquist (1969) figures 46–47 (as photographs), p. 39; Grieve & Blackall (1982) No. 81, p. 756; Pignatti-Wilkus *et al.* (2000) No. 21, p. 99; Scott (2002) No. 8, p. 181.

Caespitose perennial herb, 5–50 cm high. Stems positioned at or just above the soil surface, condensed or shortly elongated below the leaf rosette, internodes to 4.5 cm long. *Leaves* arranged in a loose, tufted rosette; oblanceolate to spathulate, flat in cross section, 0.8–8 cm long, 1.5–15 mm wide, glandular; apex subacute, terminating in a blunt knob; margin entire. *Glandular trichomes* 0.2–0.5 mm long; stalks translucent to yellow, multicellular, biseriate; heads yellow, turbinate to subglobular, 4-celled. Eglandular trichomes absent. *Scapes* 1–*c.* 20 per plant, 4.5–48 cm high, 0.3–3 mm wide, glandular on lower portion only; sterile bracts absent, occasionally singular or scattered. Inflorescence 1–50-flowered, racemose. Bracts ovate, 1.3–3.2 mm long, 0.6–1 mm wide, glabrous. Bracteoles 0.6–2 mm long, glabrous. Pedicels 3.5–30 mm long, glabrous or glandular. *Hypanthium* clavate to elliptic, 2–5 mm long, 0.7–1.6 mm wide, glabrous. Calyx lobes free, 1.5–2 mm long, 0.7–1.2 mm wide, glabrous, margin entire, apex subacute. *Corolla* pale creamy-yellow to yellow with red throat markings; abaxial surface glabrous.

Corolla tube 0.6–0.8 mm long. Corolla lobes laterally-paired, elliptic; anterior lobes 4–7.1 mm long, 2.2–4.3 mm wide; posterior lobes 3.8–6.5 mm long, 1.9–4 mm wide. *Labellum* fully twisted across calyx lobes; boss yellow, narrowly ovate to ovate, 0.4–0.9 mm long, 0.3–0.6 mm wide, margin entire; terminal appendage yellow, 0.2–1.1 mm long; lateral appendages absent. *Throat appendages* yellow, comprising 6 small tooth-like mounds, 0.1–0.3 mm long, interspersed with larger swollen mounds. *Column* 7.5–12 mm long. Anthers red to black; subtending hairs absent; pollen yellow. Stigma entire, sessile, elliptic, cushion-like. *Capsule* clavate to ellipsoidal, 4–7 mm long. Seeds brown, ellipsoidal, 0.3–0.5 mm long, 0.2–0.3 mm wide.

Selected specimens examined. WESTERN AUSTRALIA: Plot 5072, Mitchell River, 23 Oct. 1991, *A.R. Annels* ARA 1783 (PERTH); 8 miles N of Mount Barker on Albany–Perth highway, 12 Oct. 1967, *S. Carlquist* 3737 (MEL, NSW, PERTH, RSA); 7 km N of Mowen Rd on Great Northern Rd, 16 Nov. 2001, *R.J. Cranfield* 17533 (PERTH); Bowelling McAlinden Rd, 3.9 km SW of Trigwell Bridge Rd junction, 22 Nov. 1998, *V. Crowley* 926 (PERTH); Spencer Rd Reserve, 5 km N of Narrikup, 11 Nov. 1987, *E.J. Croxford* 5756 (PERTH); Kendenup, 18 Oct. 1951, *R. Ericksons.n.* (PERTH); *c.* 4.5 miles S Ellen Brook, Caves Rd, W of Margaret River, Oct. 1966, *S. James* 66.10/11 (PERTH); Point Possession picnic area, 20 km S of Albany, 20 Oct. 1993, *P.C. Jobson* 2534 (MEL, PERTH); 500 m W along Redgate Rd from Caves Rd, 29 Oct. 1997, *J.A. Wege* JAW 437 (PERTH); Just E of Goodga River Bridge on Two Peoples Bay Rd, 29 Oct. 2003, *J.A. Wege & C. Wilkins* JAW 1056 (PERTH); 800 m E of Watermans Rd on Mount Barker–Porongurups Rd, 30 Oct. 2003, *J.A. Wege* JAW 1062 (PERTH); *c.* 2.3 km N of Mornington Rd on Harris River Rd, N of Collie, 13 Nov. 2003, *J.A. Wege* JAW 1116 (PERTH); 2.13 km S on Shelley Beach Rd from Coombes Rd, West Cape Howe National Park, 4 Dec. 2003, *J.A. Wege* JAW 1161 (PERTH).

Distribution. Common along the south coast from Two Peoples Bay through to Walpole, extending inland to the Stirling Range, west through Manjimup to Cape Naturaliste, and north to the Collie region.

Habitat. Known from a variety of habitats including woodland, forest and heath, where it favours moist soils associated with granite outcropping, swamps, seepage areas and valley floors.

Phenology. Flowering specimens are known from October to December, with an isolated record for January.

Conservation status. A common and widespread species. No conservation code applies.

Typification. The BM specimen chosen here as the lectotype of *S. spathulatum* bears Brown's field slip. The MEL specimens chosen as lectotypes for *S. bellidifolium*, *S. lehmannianum* and *S. lehmannianum* ß *gracile* all bear the annotations of Sonder.

Chromosome number. James (1979) recorded a count of n=14 for specimens in the vicinity of Albany (PERTH 02948303, 02948451), the Porongurups (PERTH 02948141) and Margaret River (PERTH 02948281, 02948311, 06239293). His count of n = 13 for a population from Shannon is referrable to *S. planirosulum* (see notes under that species).

Notes. Stylidium spathulatum has a variable habit, displaying both inter- and intrapopulation variation in scape length, width and number per plant, leaf size, and the degree to which the stem is elongated. Diagnostic features include a loose, tufted leaf rosette of oblanceolate to spathulate leaves, glandular trichomes with turbinate heads that are restricted to the stem, leaves, lower scape and sometimes the pedicels, and a yellow corolla with red throat markings and small yellow throat appendages.

Stylidium planirosulum Wege, *sp. nov.*

Stylidio spathulato affine sed foliorum rosula appressa et trichomatibus longioribus differt.

Typus: Granite outcrop 1.4 km S of Middleton Road on South Western Highway, 11.Nov. 2002, *J.A. Wege* JAW 807 (*holo*: PERTH 06788475; *iso*: CANB, MEL, K, W).

Caespitose perennial herb, 10–60 cm high. Stems positioned at or just above the soil surface, condensed or rarely very shortly elongated below the leaf rosette. *Leaves* arranged in a somewhat flattened rosette; oblanceolate to spathulate, flat in cross section, 1–5.2 cm long, 1.8–13 mm wide, glandular; apex subacute, terminating in a blunt knob; margin entire. *Glandular trichomes* 0.2–1 mm long; stalks translucent, multicellular, biseriate; heads yellow to yellowish-red, turbinate, comprised of cells in 4 columns and 2 or 3 rows. Eglandular trichomes absent. *Scapes* 2–8 per plant, 7–50 cm high, 0.3–1.6 mm wide, glandular on lower portion only; sterile bracts present, scattered. Inflorescence 4–26-flowered, racemose. Bracts subulate, 1.8–2.5 mm long, 0.6–0.7 mm wide, glabrous. Bracteoles 0.7–1.5 mm long, glabrous. Pedicels 4–22 mm long, glandular above bracteoles (rarely below). *Hypanthium* clavate to elliptic, 1.5–4.5 mm long, 0.7–1.4 mm wide, glabrous. Calyx lobes free, 1.5–2.8 mm long, 0.6–0.9 mm wide, glabrous, margin entire, apex subacute. *Corolla* yellow with red throat markings; abaxial surface glabrous. Corolla tube 0.8–1.2 mm long. Corolla lobes laterally-paired, elliptic; anterior lobes 4.2–6 mm long, 2.5–4.2 mm wide; posterior lobes 4.5–5.8 mm long, 2.5–4 mm wide. *Labellum* fully twisted across calyx lobes; boss yellow, ovate, 0.5–0.8 mm long, 0.4–0.6 mm wide, margin entire; terminal appendage yellow, 0.2–0.9 mm long; lateral appendages present (rarely absent), yellow, 0.1 mm long, glabrous. *Throat appendages* yellow, comprising 6–8 small teeth, 0.1–0.3 mm long, interspersed with larger swollen mounds. *Column* 8–10.2 mm long. Anthers red to black; subtending hairs absent; pollen yellow. Stigma entire, sessile, elliptic, cushion-like. *Capsule* ellipsoidal, 3–5 mm long. Seeds brown, ellipsoidal to obloid, 0.35–0.45 mm long, 0.2–0.3 mm wide. (Figure 2)

Selected specimens examined. WESTERN AUSTRALIA: Between Denmark and Nornalup, 10 Nov. 1967, *S. Carlquist* 4055 (RSA); *c.* 5 miles W Denmark, Nov. 1971, *S. James* 71.11/25 (PERTH); Shannon Rock, Oct. 1972, *S. James* 72.10/71 (PERTH); 26 miles NE Walpole, along Ordinance Rd, 23 Dec. 1971, *G.J. Keighery* 2743 (PERTH); 1.6 km E of Mount Shadforth, 6 km W of Denmark, 3 Jan. 1994, *A.E. Raudino* 008 (MEL, NSW, PERTH); Mount Lindesay walk trail, 12 Nov. 2002, *J.A. Wege* JAW 824 (PERTH); Intersection of Gully and Monastery Rds, Walpole, 4 Dec. 2003, *J.A. Wege* JAW 1171 (PERTH); Loop Walk at Mount Frankland, N of Walpole, 8 Jan. 2004, *J.A. Wege* JAW 1186 (AD, CANB, MEL, NSW, PERTH); Near Mount Chudalup, 15 Nov. 1978, *E. Wittwer* W 2202 (PERTH).

Distribution. Known from karri forest near Denmark, west to D'Entrecasteaux National Park and throughout the Frankland and Shannon regions north to Manjimup.

Habitat. Stylidium planirosulum favours the moist run-off areas peripheral to granite outcropping. This species has also been recorded growing on limestone soils in *Agonis* woodland near Walpole.

Phenology. Flowering specimens are known from October through to January.

Conservation status. Represented within several conservation reserves and as such no conservation code applies.

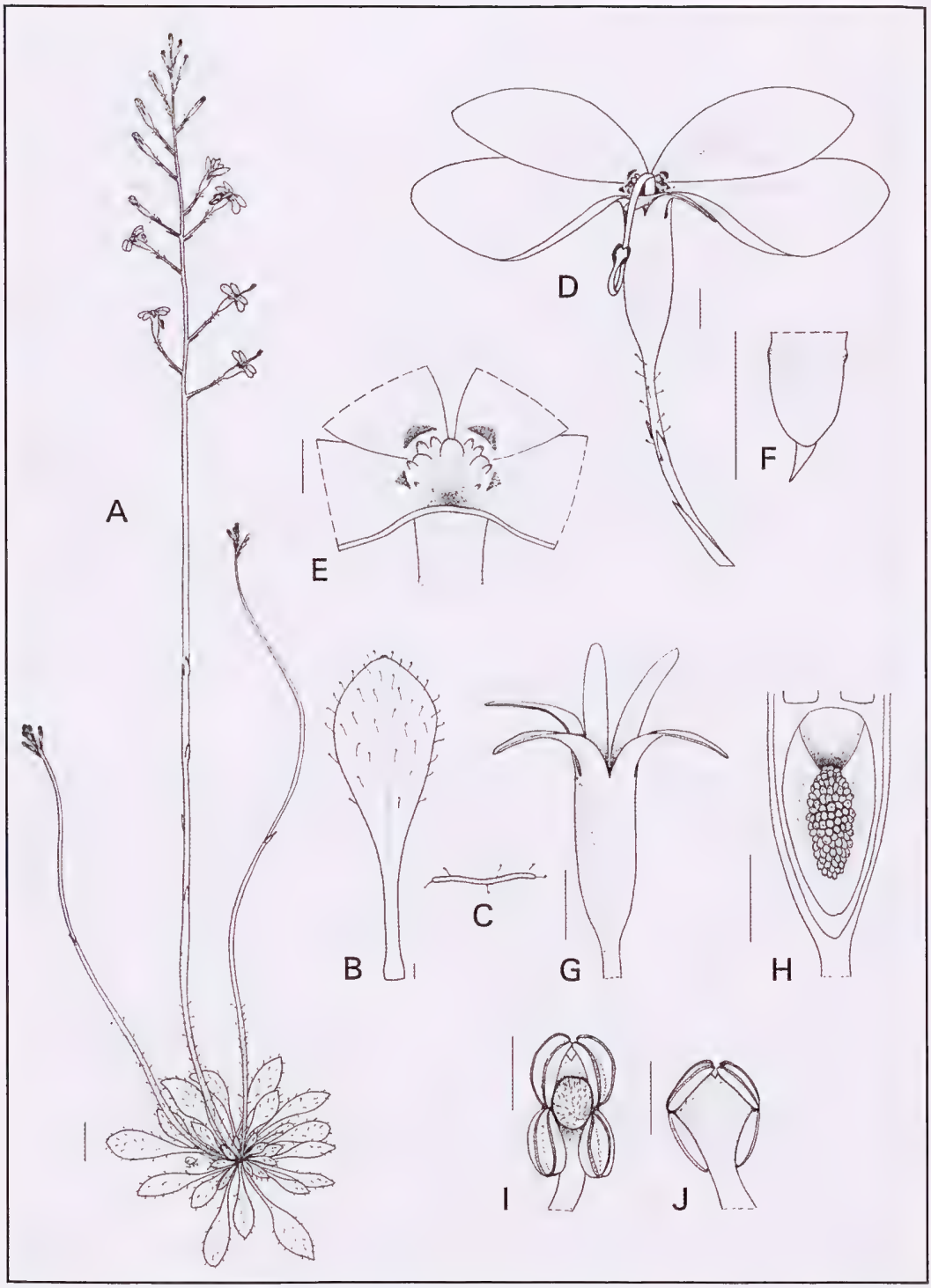

Figure 2. *Stylidium planirosulum* (JAW 807). A – habit; B – leaf; C – T.S. leaf; D – flower; E – throat appendages; F – labellum; G – hypanthium; H – L.S. hypanthium; I – dehisced anthers and developing stigma; J – connective. Scale bars A: 1cm; B–J: 1mm.

Etymology. From the Latin (*plani* – flat and *rosula* – rosette) in reference to the leaf rosette which tends to be adpressed to the soil surface. This name has been chosen in view of the annotation on the aforementioned chromosome voucher of James, which reads: "*Flat rosette form. To be described as a new species*?" Whilst a flattened rosette was clear in all populations examined in the field, it can be difficult to interpret on pressed material.

Chromosome number. James (1979) recorded a count of n = 13 under *S. spathulatum* which is applicable to *S. planirosulum* (PERTH 02948567). The type material of *S. planirosulum* was collected in the same vicinity as the chromosome voucher.

Affinities. *Stylidium planirosulum* is readily discernable from *S. spathulatum* using leaf characteristics and consequently sterile material can be identified with some confidence. Unlike *S. spathulatum*, *S. planirosulum* possesses a flattened (rather than tufted) leaf rosette bearing fewer trichomes with longer stalks and larger glandular heads (see Figure 1).

Stylidium planirosulum may also be confused with *S. lineatum* Sond., a species that also possesses a flattened leaf rosette bearing long glandular trichomes. *Stylidium lineatum* tends to have a more robust scape, striated leaves with more rounded apices, and flowers bearing prominent linear throat appendages (see Erickson 1958, p. 113). In contrast to the karri forest habitat of *S. planirosulum*, *S. lineatum* occurs in more northern jarrah and/or marri forests from Perth south to the Nannup region and east to Dryandra forest.

Stylidium glandulosissimum Wege, *sp. nov.*

Stylidio spathulato affine sed trichomatibus brevibus et folis anguste oblanceolatis differt.

Typus: S boundary of Stirling Range National Park on Chester Pass Rd, 31 Oct. 2003, *J.A. Wege and C. Wilkins* JAW 1069 (*holo*: PERTH 06788459; *iso*: CANB, MEL).

?Stylidium luteum var. *glandulosum* Mildbr. *in* A. Engler, Pflanzenreich IV, 278: 57 (1908). *Stylidium spathulatum* var. *glandulosum* (Mildbr.) F.L.Erickson & J.H.Willis *Victorian Naturalist* 72: 134 (1956). *Stylidium spathulatum* subsp. *glandulosum* (Mildbr.) Carlquist *Aliso* 7: 38 (1969). *Type*: West-Australien: Distr. Stirling: Ohne genauen Standort (*syn*: Maxwell, *n.v.*; F.v. Mueller, *n.v.*).

Illustrations. Grieve & Blackall (1982) No. 81b p. 756.

Stilted perennial herb, 6–30 cm high. Stems elevated above the soil surface, branched or unbranched, internodes to 2.5 cm long. *Leaves* arranged in a tufted rosette, often scattered below; linear to oblanceolate, flat to v-shaped in cross section, 0.6–4.8 cm long, 0.6–4 mm wide, glandular; apex subacute, terminating in a blunt knob; margin entire. *Glandular trichomes* 0.05–0.3 mm long; stalks translucent to yellow, multicellular, biseriate; heads yellow, flattened, comprising cells divided in a horizontal plane. Eglandular trichomes absent. *Scapes* 1–5 per plant, 5–29 cm high, 0.5–2 mm wide, densely glandular; sterile bracts absent, occasionally singular or scattered. Inflorescence 3–28-flowered, racemose. Bracts linear to subulate, 1.5–9 mm long, 0.6–0.7 mm wide, glandular. Bracteoles 1–2 mm long, glandular. Pedicels 4–14 mm long, glandular. *Hypanthium* elliptic, 1.5–3 mm long, 0.8–1.8 mm wide, glandular. Calyx lobes free, 2.8–4 mm long, 0.6–1 mm wide, glandular, margin entire, apex subacute. *Corolla* yellow, throat markings absent, throat dark yellow; abaxial surface often with red markings, glabrous. Corolla tube 1–

1.7 mm long. Corolla lobes laterally-paired; elliptic; anterior lobes 5–6.5 mm long, 3–4.2 mm wide; posterior lobes 5–6.2 mm long, 3–3.9 mm wide. *Labellum* fully twisted across calyx lobes; boss yellow, ovate to elliptic, 0.6–1.1 mm long, 0.5–0.8 mm wide, margin entire; terminal appendage yellow, 0.3–0.9 mm long; lateral appendages absent or 0.15–0.3 mm long, yellow, glabrous or gland-tipped. *Throat appendages* 8, yellow, truncate or subulate or tooth-like, 0.5–1 mm long, 0.2–0.6 mm wide. *Column* 12.5–14 mm long. Anthers red to red–black; subtending hairs absent; pollen yellow. Stigma entire, sessile, elliptic, cushion-like. *Capsule* and seed not viewed. (Figure 3)

Selected specimens examined. WESTERN AUSTRALIA: 0/Q 205/6 Hume Peak, Stirling Range, 28 Nov. 1994, *S. Barrett* 232 (PERTH); *c.* 8 miles E of Cranbrook, 12 Oct. 1967, *S. Carlquist* 3752 (CANB, K, MEL, NSW, PERTH, RSA); 68 miles from Albany along the road from Manypeaks to Jerramungup, 14 Oct. 1974, *S. Carlquist* 6028 (PERTH); Stirling Range Drive, 24 km from Chester Pass Rd, lookout SW of Mount Gog, 23 Oct. 1991, *W. Greuter* 23157 (PERTH); Just S of 42 mile peg, Borden Rd S of Stirlings, Nov. 1971, *S. James* 71.11/39 (PERTH); 5 km NW of Chillinup Pool, 29 Oct. 1974, *K.R. Newbey* 4544 (PERTH); 3.3 km S along Boatharbour Rd from Hassell Highway, 28 Oct. 2003, *J.A. Wege and C. Wilkins* JAW 1045 (PERTH, W).

Distribution and habitat. Known from the Stirling Ranges south-east to the Wellstead area.

Habitat. Favours mallee shrubland/heath in upland habitats with well-drained sandy-clay soils.

Phenology. Flowering specimens are known from October to December.

Conservation status. Geographically restricted but well represented within Stirling Range National Park. Not considered threatened.

Etymology. The species epithet, *glandulosissimum* (most glandular), is of Latin origin and has been chosen to reflect the densely hairy nature of this taxon.

Typification. There is some confusion as to the identity of the entity described by Mildbraed (1908) as *S. luteum* var. *glandulosum*. Mildbraed cites two type specimens, one collected by Maxwell and the other by Von Mueller, both of which were probably housed at B. The *Stylidium* holdings at B were destroyed during World War II (Botanical Museum Berlin-Dahlem 1999) and duplicate material has not been located. It can be assumed that Mildbraed's taxon has a stilted, basally tufted habit with narrow leaves like that of *S. luteum* R.Br. The type description states that the leaves, scape and sometimes all of the few-flowered inflorescence are shortly glandular-pubescent.

It is more than likely that *S. glandulosissimum* was represented in this type material. The protologue states the type of *S. luteum* var. *glandulosum* was collected from the Stirling district, within the known range of *S. glandulosissimum*. Furthermore, Mildbraed refers to the inflorescence of some specimens as totally glandular hairy. *Stylidium glandulosissimum* is the only known trigger plant from this region with this hair distribution and habit form. Mildbraed does, however, indicate that the distribution of inflorescence hairs in *S. luteum* var. *glandulosum* is variable. Since hair distribution in *S. glandulosissimum* is consistent across its range, it is likely that Mildbraed's type material comprised more than one taxon. This is not an unusual occurrence in the early taxonomic research on *Stylidium*. Botanists in Europe had only a small number of herbarium specimens at their disposal and trigger plants are notoriously difficult to work with in the dried state. On the basis of Mildbraed's description of *S. luteum* var. *glandulosum*, it is plausible that individuals from the *S. squamellosum* DC. complex were represented

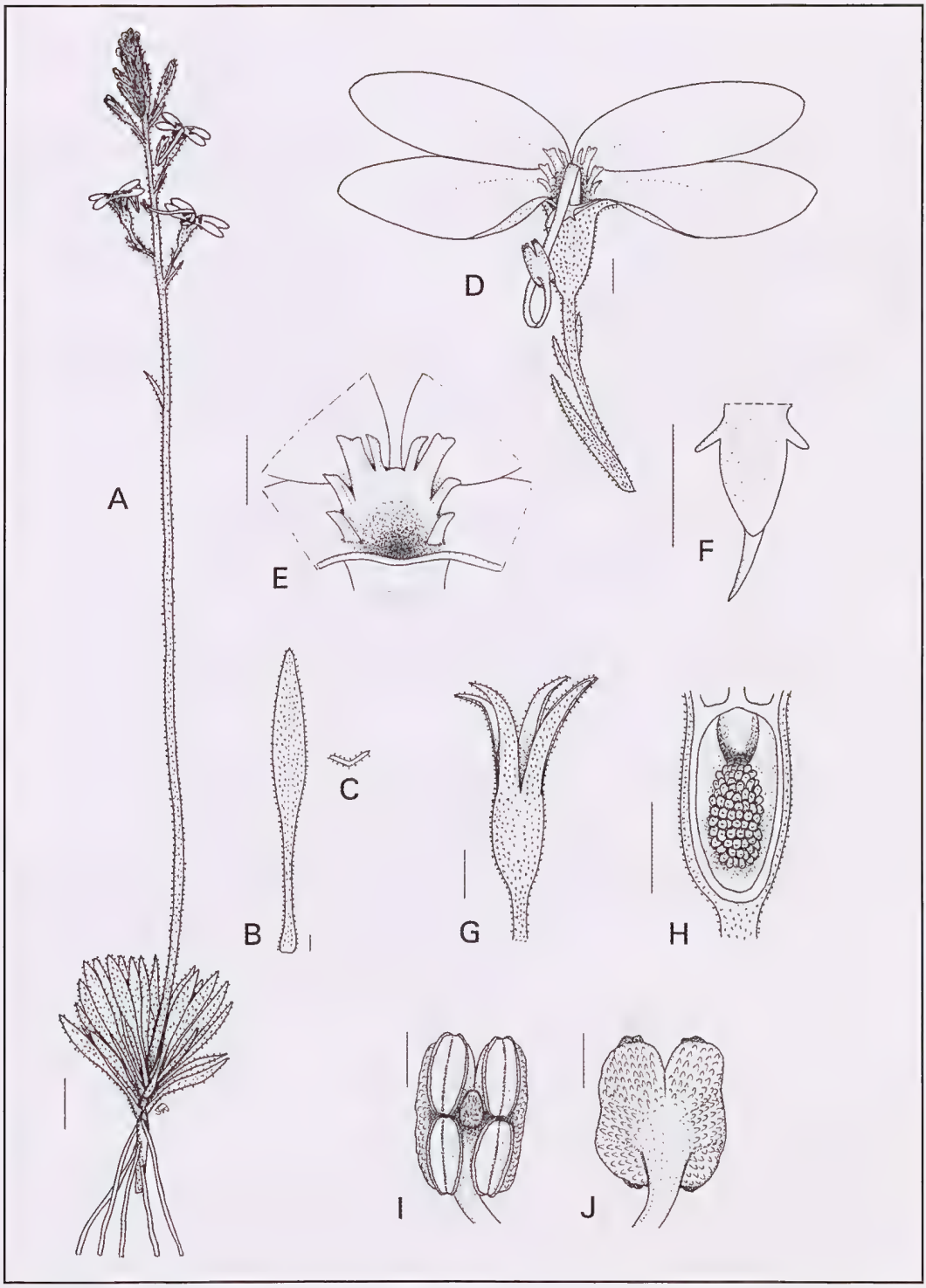

Figure 3. *Stylidium glandulosissimum* (JAW 1069). A – habit; B – leaf; C – T.S. leaf; D – flower; E – throat appendages; F – labellum; G – hypanthium; H – L.S. hypanthium; I – dehisced anthers and developing stigma; J – cellular connective. Scale bars A: 1cm; B–J: 1mm.

amongst the type material. Members of this complex possess a comparable habit, glandular leaves, glabrous lower scapes and sparingly glandular inflorescences, and are known to occur in the Stirling District.

Erickson & Willis (1956) regarded *S. luteum* var. *glandulosum* as a variety of *S. spathulatum*, arguing that the more open inflorescence, glandular leaves, and glabrous, oblong hypanthium were characteristic of this species and not of *S. luteum*. This reclassification appears to have based on the examination of five Maxwell specimens housed at MEL, which were perceived as duplicate type material; however, this interpretation is questioned here. The labels for all specimens bear general locality information ("S.W. Austr." or "W. Austr.") and do not refer to the Stirling District. The specimens on three of the sheets (MEL 293435, 293436 and 293439) possess eglandular trichomes on the leaves rather than glandular trichomes as cited in the type description. These specimens are referable to the recently named *S. daphne* Lowrie & Kenneally. The fourth sheet (MEL 293438) comprises flowering material only, but also appears referable to *S. daphne*. *Stylidium daphne* is geographically restricted to the south coast east of Albany, and is not known from the Stirling Ranges. Specimens on the fifth sheet (MEL 293437) are referable to the *S. squamellosum* DC. complex. There is a slight possibility that this last collection is duplicate type material of *S. luteum* var. *glandulosum* (see preceding paragraph).

Upon raising *S. spathulatum* var. *glandulosum* to subspecific level, Carlquist (1969) made no reference to the type material or type description. On the basis of his collections, his concept of this taxon is known to match that described herein for *S. glandulosissimum*.

The epithet *glandulosum* cannot be applied to Mildbraed's taxon at the species level as it is already in use (*Stylidium glandulosum* Salisb.). Rather than proposing a *nom. nov.* based on extinct types of ambiguous content, a new species based on a new type has been published so as to avoid further taxonomic confusion.

Chromosome number. James (1979) recorded a chromosome count of n = 13 (PERTH 02948591).

Affinities. Stylidium glandulosissimum can be differentiated from *S. spathulatum* by its narrower leaves, lack of throat markings, more conspicuous throat appendages and structurally distinct trichomes (see Figure 1). Furthermore, the inflorescence in *S. glandulosissimum* is typically glandular throughout, unlike that of *S. spathulatum* in which the hairs are restricted to the base of the scape and the pedicels.

Stylidium glandulosissimum most closely resembles *Stylidium gloeophyllum*. Comparative notes are given below.

Stylidium gloeophyllum Wege, *sp. nov.*

Stylidio glandulosissimo affine sed habitu densiore et columna breviore differt.

Typus: S of Mount Chudalup on Northcliffe–Windy Harbour Rd [precise locality withheld], 5 Dec. 2003, *J.A. Wege* 1178 (*holo*: PERTH 06788467; *iso*: CANB, K, MEL, W).

Caespitose perennial herb, 13–47 cm high. Stems positioned at or just above the soil surface, condensed. *Leaves* arranged in a loose, tufted rosette; oblanceolate, petioles conspicuous, flat in cross section, 1.5–7 cm long, 2–12 mm wide, glandular; apex subacute, terminating in a blunt knob; margin

entire. *Glandular trichomes* 0.08–0.3 mm long; stalks translucent, multicellular, biseriate; heads yellow, flattened, comprising cells divided in a horizontal plane. Eglandular trichomes absent. *Scapes* (1)2–*c.*12 per plant, 10–46 cm high, 0.4–1.8 mm wide; glandular on lower portion only; sterile bracts absent or scattered. Inflorescence 5–23-flowered, racemose. Bracts subulate, 1.5–3.2 mm long, 0.5–0.6 mm wide, glabrous, or with glandular trichomes on margins and base. Bracteoles 0.7–1.5 mm long, glabrous. Pedicels 2–15 mm long, glabrous (rarely sparingly glandular). *Hypanthium* clavate to elliptic, 1.5–3 mm long, 0.7–1.2 mm wide, glabrous. Calyx lobes partly fused (2 fused and 3 free), 1.8–3.6 mm long, 0.5–0.8 mm wide, glabrous, margin entire, apex subacute. *Corolla* pale yellow to apricot-pink, throat markings absent, throat dark yellow; abaxial surface with dark apricot-pink markings, glabrous. Corolla tube 0.7–1 mm long. Corolla lobes laterally-paired, elliptic; anterior lobes 4–6.5 mm long, 2.2–3.2 mm wide; posterior lobes 3.8–5.5 mm long, 2–3 mm wide. *Labellum* fully twisted across calyx lobes; boss yellow, ovate to elliptic, 0.4–0.9 mm long, 0.3–0.7 mm wide, margin entire; terminal appendage yellow, 0.3–1 mm long; lateral appendages absent or 0.05–0.2 mm long, yellow, glabrous. *Throat appendages* 6 or 8, yellow (occasionally with pink tips), truncate or subulate or tooth-like, entire or bifurcate or trifurcate, 0.1–1.2 mm long, 0.1–0.5 mm wide. *Column* 7–10 mm long. Anthers red–black to black; subtending hairs absent; pollen yellow. Stigma entire, sessile, circular to elliptic, cushion-like. *Capsule* ellipsoidal, 3–4.5 mm long. Seeds brown, ellipsoidal to obloid, 0.4–0.5 mm long, 0.2–0.3 mm wide. (Figure 4)

Selected specimens examined. WESTERN AUSTRALIA: Waychinicup River [precise locality withheld], 12 Nov. 1996, *E.J. Croxford* 7623 (PERTH); Mouliup, 25 miles E of Albany, Oct. 1931, *A. Elders.n.* (NSW); Toward Two Peoples Bay, Albany [precise locality withheld], 28 Oct. 1985, *N. Hoyle* 1451 (CANB, PERTH); S on Cheyne Beach Rd from South Coast Hwy [precise locality withheld], 28 Oct. 2003, *J.A. Wege & C. Wilkins* JAW 1049 (AD, CANB, MEL, NSW, PERTH, RSA).

Distribution. Known from a few populations in the Waychinicup region and the type location south of Northcliffe (over 200 km to the west).

Habitat. Grows in dense shrubland in moist habitats near swamps or granite outcrops.

Phenology. Flowers have been collected from October to December.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. This species is known from a handful of populations, some of which are within conservation reserves. Not under immediate threat, but in need of further survey.

Etymology. The species epithet is taken from the Greek (*gloeo* – sticky and *phyllum* – leaf) in reference to the sticky mucilage released from the glandular indumentum.

Chromosome number. Unknown.

Affinities. Stylidium gloeophyllum has affinity to *S. glandulosissimum* on the basis of trichome type (Figures 1B–C). *Stylidium gloeophyllum* can be differentiated from *S. glandulosissimum* by its shorter column and denser habit. The leaves of *S. gloeophyllum* tend to be longer and broader and the leaf rosette usually sits at soil level. In contrast, individuals of *S. glandulosissimum* are more slender with the stems raised slightly above the soil and supported by conspicuous adventitious roots. *Stylidium gloeophyllum* prefers winter-wet habitats rather than the upland, well-drained habitats of *S. glandulosissimum*. Different habitat preferences are often a feature of species differentiation in *Stylidium* (Carlquist 1969; Carlquist 1976; Coates 1982).

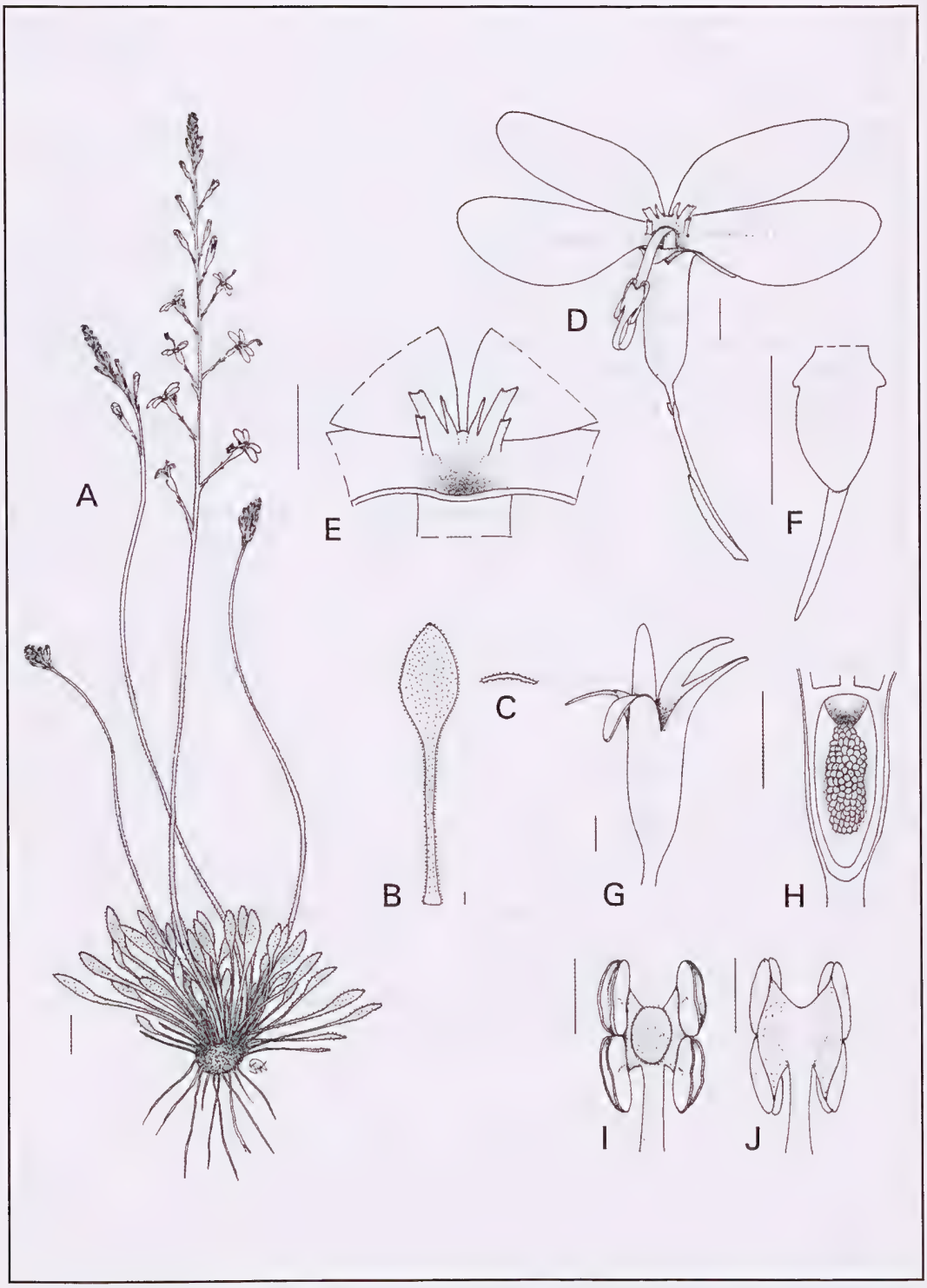

Figure 4. *Stylidium gloeophyllum* (JAW 1178). A – habit; B – leaf; C – T.S. leaf; D – flower; E – throat appendages; F – labellum; G – hypanthium; H – L.S. hypanthium; I – dehisced anthers and stigma; J – connective. Scale bars A: 1cm; B–J: 1mm.

Additional note. *Stylidium spathulatum* subsp. *acuminatum* Carlquist was erected by Carlquist (1969) on the basis of its acuminate, flabellately-veined leaves, densely glandular-hairy inflorescence and acute calyx lobes. Examination of his type collection, collected from between Collie and Harvey, reveals that this entity possesses an indumentum of both glandular and eglandular trichomes. It can be further differentiated from *S. spathulatum* by its acute throat appendages and lack of throat markings. These differences are sufficient to warrant raising this entity to species level; however, the circumscription of this taxon is unclear.

Only a handful of collections from the Collie region precisely match the robust, basally tufted and exceedingly hairy type specimen. A more widespread entity, with leaf and calyx apices, trichomes and flowers comparable to those of *S. spathulatum* subsp. *acuminatum*, is known from the Whicher Range through to Albany. This entity, referred to by Wheeler *et al.* (2002) by the phrase-name '*Stylidium* sp. Mt Barker (*E.J. Croxford* 1906)', tends to have narrower leaves and a more slender habit, typically with short leafy stems under the leaf rosette. Furthermore, the inflorescence indumentum is usually restricted to the lower portion of the scape (although some variation in trichome distribution is apparent between populations). Features such as trichome distribution and leaf size must be used with caution when delimiting species of *Stylidium*. In this case, additional field observations are deemed necessary to assess whether *Stylidium spathulatum* subsp. *acuminatum* and '*Stylidium* sp. Mt Barker (*E.J. Croxford* 1906)' are indeed two separate entities, or one variable taxon.

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